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The Feasibility of Barn Drying Hay in Great Britain II

by M J Lee

SUMMARY

The probability of being able to produce good quality hay by barn drying in Britain has been assessed. It has been assumed that techniques similar to those used in Scandinavia would be employed. The study indicates that in spring and early summer drying of hay would be economically viable over much of inland Britain, with the exceptions of Cornwall, West Wales and North and West Scotland. However in many places away from the southeast the hay would need to be made little and often; not an efficient method. There is the added problem that in most years at least one or two cuts could be lost or of poor quality due to weather conditions not being suitable immediately after the hay has been loaded into the barn. The use of weather forecast information would diminish this problem.

1. Introduction

Jeppsson (1981) gives a detailed explanation of how hay can be dried within barns after less than one day of field drying. He has also shown, using weather data, that this method of drying hay is a viable proposition in the warm dry weather of a central Scandinavian summer, without the need to add extra heat.

The process of barn drying involves the use of fans to blow ambient air through a loose stack of hay from below. To prevent deterioration of the hay it must be dried to below about 30% moisture content (wet basis) within a week. The rate of drying will depend upon the power of the fans, the moisture content of the hay when loaded, the depth of hay and the humidity of the air being blown through the stack.

In Lee (1984) an hour by hour analysis was made of drying power of the air from May to September at various UK stations. This indicated that on average most stations had a period in the day when the humidity was sufficiently low to allow barn drying to take place.

Since barn drying needs several consecutive good drying days, it is necessary to establish the length of periods of good drying weather and how often they occur. It is this question that is addressed in this memorandum.

2. Method

Hourly humidity data from 22 stations in Great Britain (see Figure 1) have been analysed using the methods explained by Lee (1984). A good drying day is defined as one where the ambient vapour pressure deficit exceeds the critical value for drying to 30% moisture content, every hour between the hours of 0900 and 1800. The psychrometric constant has been selected assuming the air flow characteristics of a Stephenson screen.

3. Analysis

Figures for the frequency of consecutive days of good drying (hereafter GDDs) for each station for each month have been produced, together with the number of times in a month a particular number of consecutive GDDs are likely to occur.

Various meaningful combinations of consecutive days and frequency of occurrence have been considered based on the following reasoning.

In order to achieve complete drying before hay deterioration commences the manually controlled factors such as fan power and depth of moist forage must be regulated. To convert a standard depth load of about 4 metres into good quality hay, good day-time drying conditions should prevail for the first 5 days after loading, when the fans would be run continuously. For a period of up to another 5 days the fans need be run for only a few hours a day, if no further hay is added. Over this latter period the air humidity becomes much less important since the hay has dried enough for

deterioration not to occur, but not enough to allow rewetting, except in very damp conditions. If a further load of hay is added after the first 5 days then another 5 day period of continuous fan running would be needed.

With powerful fans and a shallower stack the drying period can be reduced, but a period of two consecutive GDDs would be an absolute minimum needed, if economically viable amounts of hay are to be made.

Based on this information 4 combinations of consecutive drying days and return periods have been analysed:

i. Two GDDs twice in the month - minimum economically viable conditions.

ii. Two GDDs five times in the month - good enough for producing small quantities of hay regularly.

iii. Five GDDs twice in the month - minimum necessary for producing a large quantity of hay economically.

iv. Five GDDs five times in the month - ideally needed to produce large amounts of hay without hindrance from the weather.

The results are presented on maps (Figures 2-21) as the percentage of years when the specified conditions are likely to occur in any month. The small number of stations with the correct data meant that a high degree of subjectivity went into producing the contours. Consequently the maps only give general guidance rather than precise figures.

The 40% line (2 years in 5) has been arbitrarily taken to separate areas with good and bad hay drying prospects. Other contours could equally be used, depending upon the degree of certainty required.

4. Conclusions

The information in Figures 2-6 indicates that barn hay drying is not viable in Northern Scotland, the Scottish Isles, North Devon, Cornwall, Pembrokeshire and the north east coastal strip from the Scottish Borders to the Wash, at any time of year. In all other areas, at least some hay could be made in most years over the May-July period. By August the area of non-viability becomes increasingly large from the north and west, until by September barn hay drying is viable only in East Anglia.

Small amounts of hay could be made consistently over Central Scotland and much of England away from the coast in the early summer (Figs. 7, 8). In July (Fig. 9) the area is restricted to the Midlands and southeast, whilst in August (Fig. 10) only an area roughly covering Cambridgeshire consistently presents promising conditions. By September (Fig. 11)

conditions for producing significant small quantities of hay will only occur at best 1 year in ten, and then only in the East Midlands. Elsewhere prospects are almost non-existent.

The likelihood of being able to make large amounts of barn dried hay is not good, even in the south east. May to July is again the best period (Figs. 12-14), but even then only 1-2 years in five have suitable weather. August and September (Figs. 15-16) can be disregarded.

Figures 17-21 indicate that the opportunities for making large amounts of hay are very rare. The best prospects are in the south east in June when one year in five should be sufficiently dry to proceed unhindered throughout the month.

The need to have access to a reliable forecst is essential to prevent the loss of some cuts during the summer. This becomes increasingly important as the amount of hay being made increases, and the drying time lengthens. Either a specialist barn hay drying forecast on an IT system or a Weather Centre consultancy would be a great asset.

5. References

R Jeppsson 1979 Barn drawing: weather statistics and the use of fans - Swedish Institute of Agricultural Engineering (UPPSALA).

M J Lee 1984 The feasibility of barn drying hay in the United Kingdom - Agricultural Memorandum No. 1010 (unpublished).

Key word: Barn hay drying.

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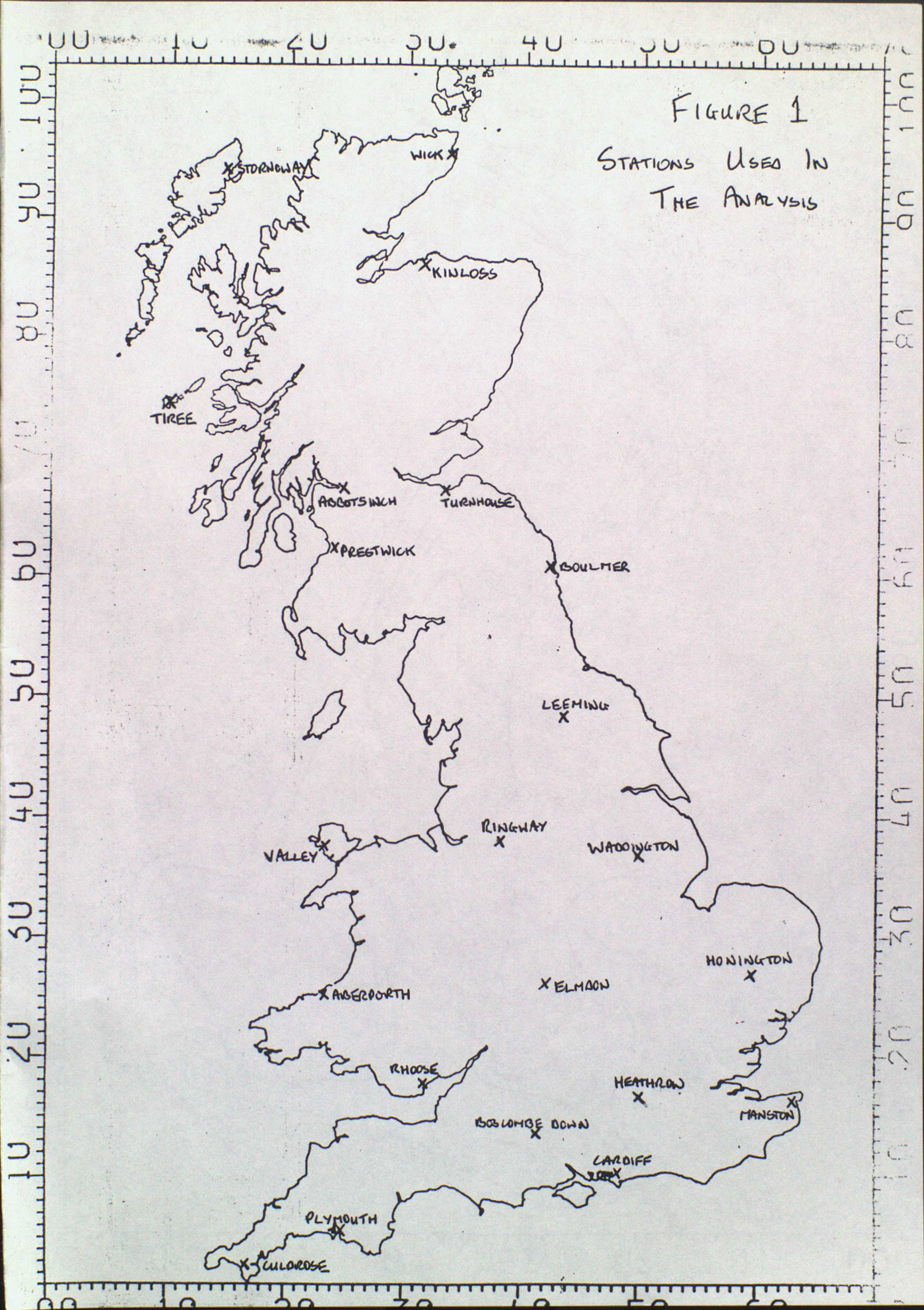

FIGURE 1

STATIONS USED IN THE ANALYSIS

FIGURE 2

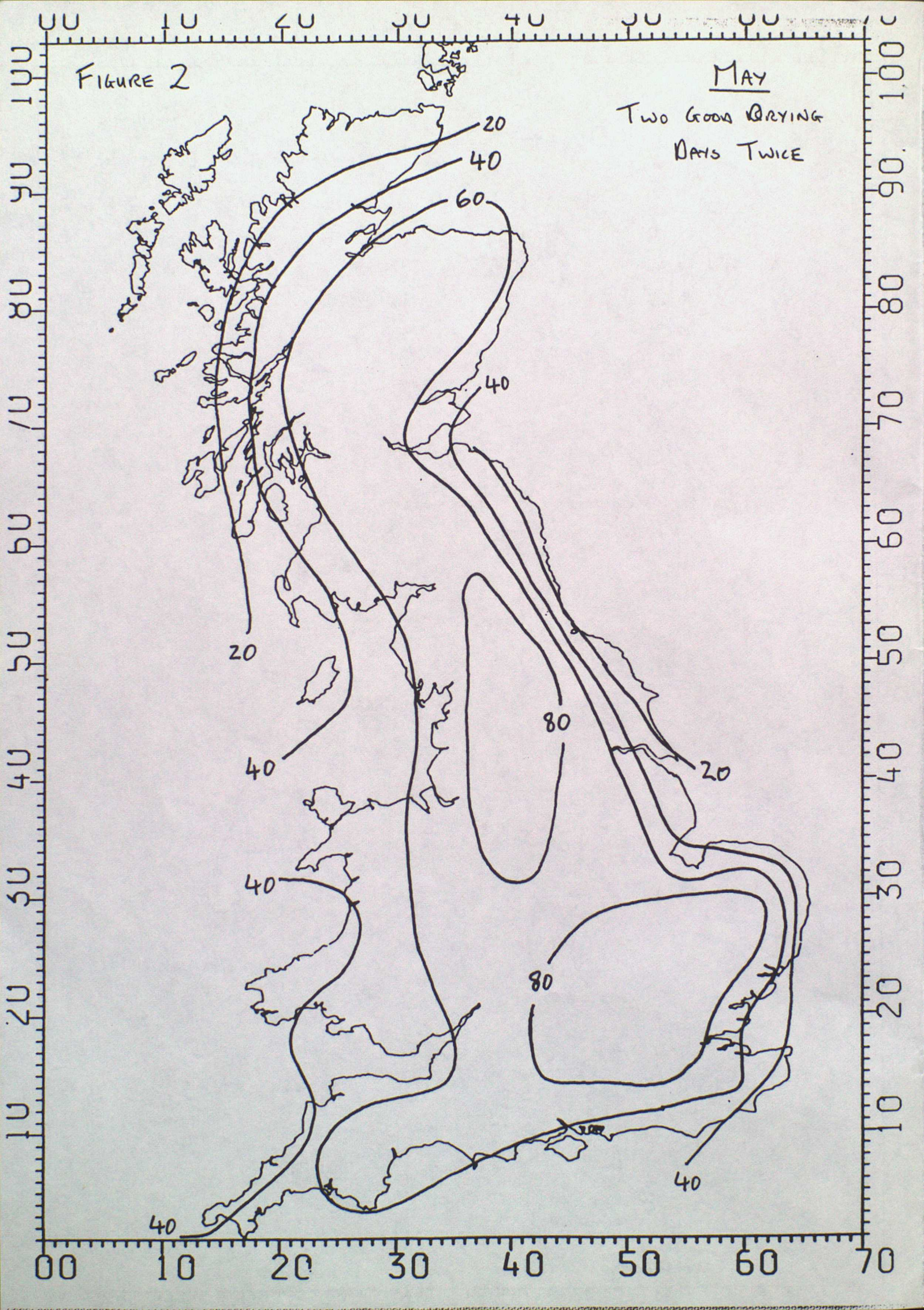
MAY
TWO GOOD DRYING DAYS TWICE
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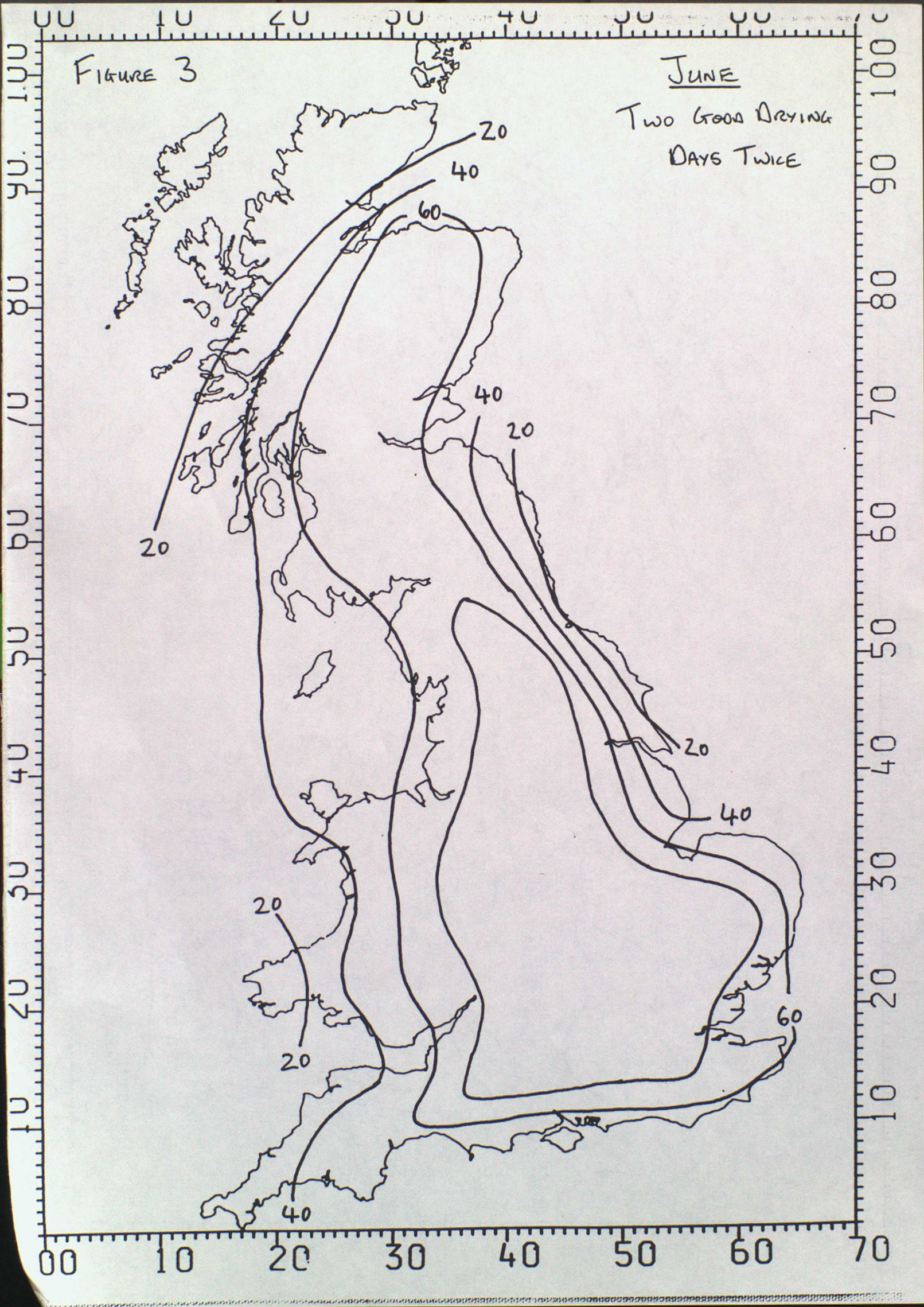
FIGURE 3


JUNE
TWO GOOD DRYING DAYS TWICE
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100 90 80 70 60 50 40 30 20 10

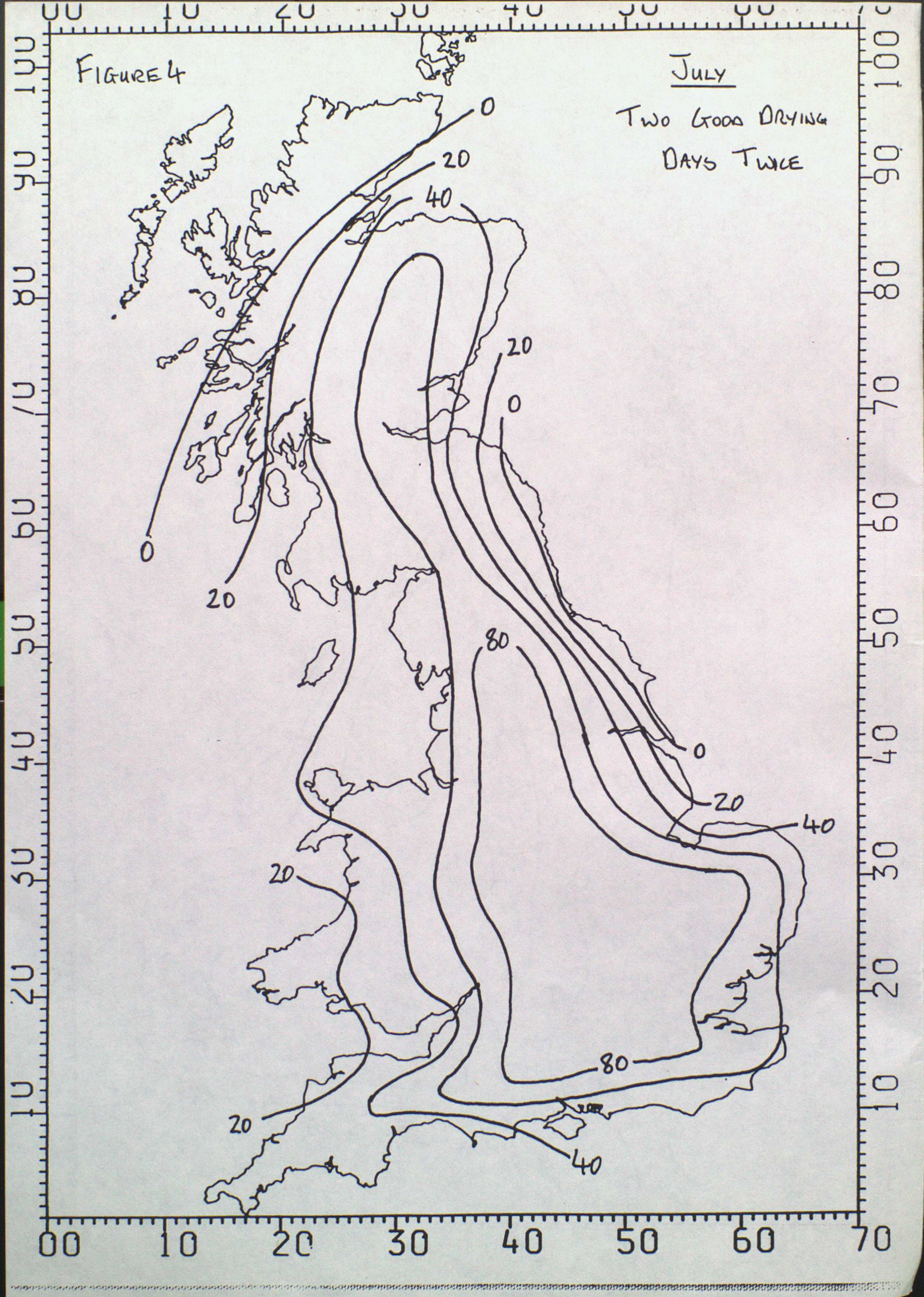
FIGURE 4
JULY
TWO GOOD DRYING DAYS TWICE
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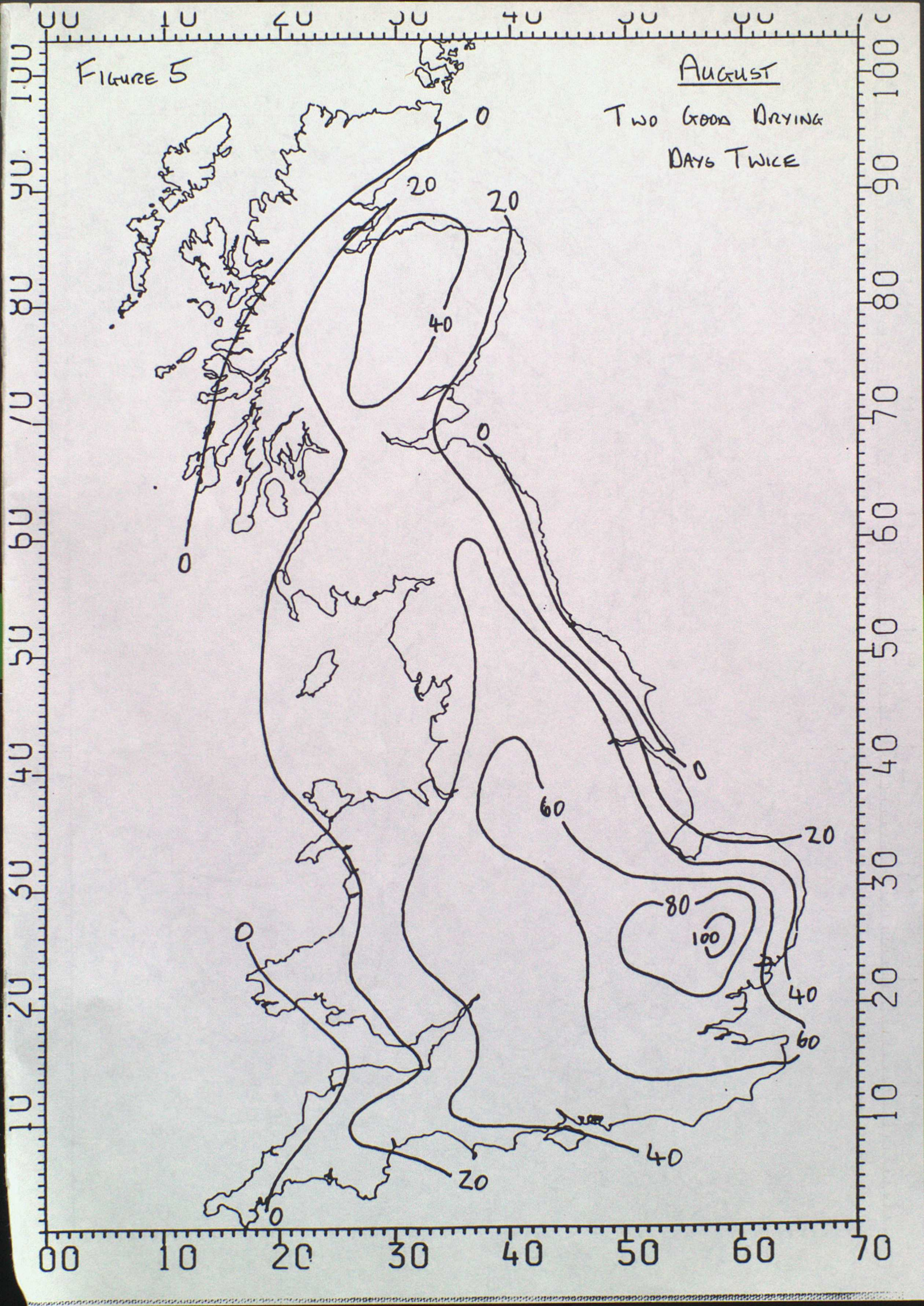
FIGURE 5
AUGUST
TWO GOOD DRYING DAYS TWICE
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FIGURE 6
SEPTEMBER
TWO GOOD DRYING DAYS TWICE
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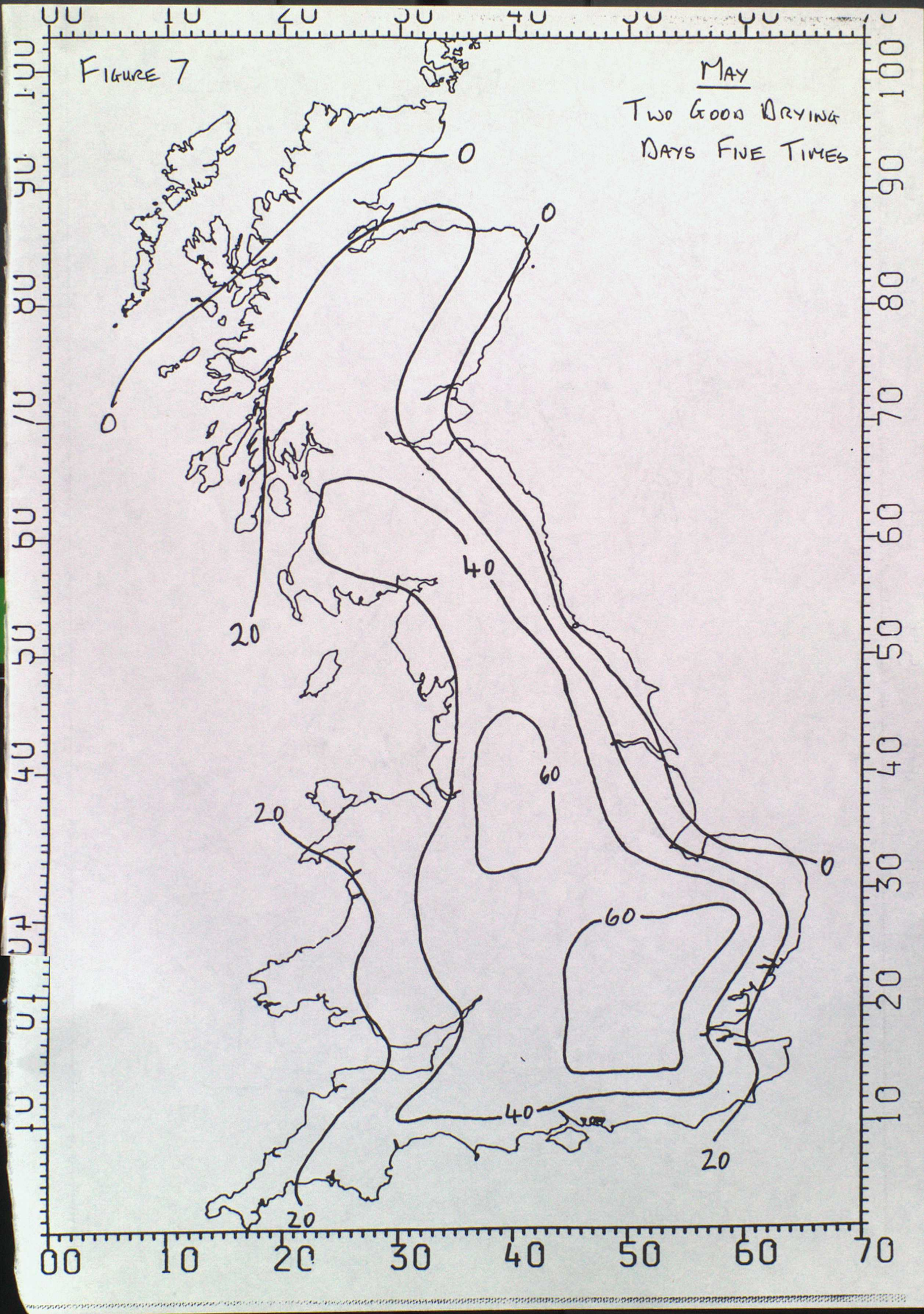
FIGURE 7
MAY
TWO GOOD DRYING DAYS FIVE TIMES
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FIGURE 8

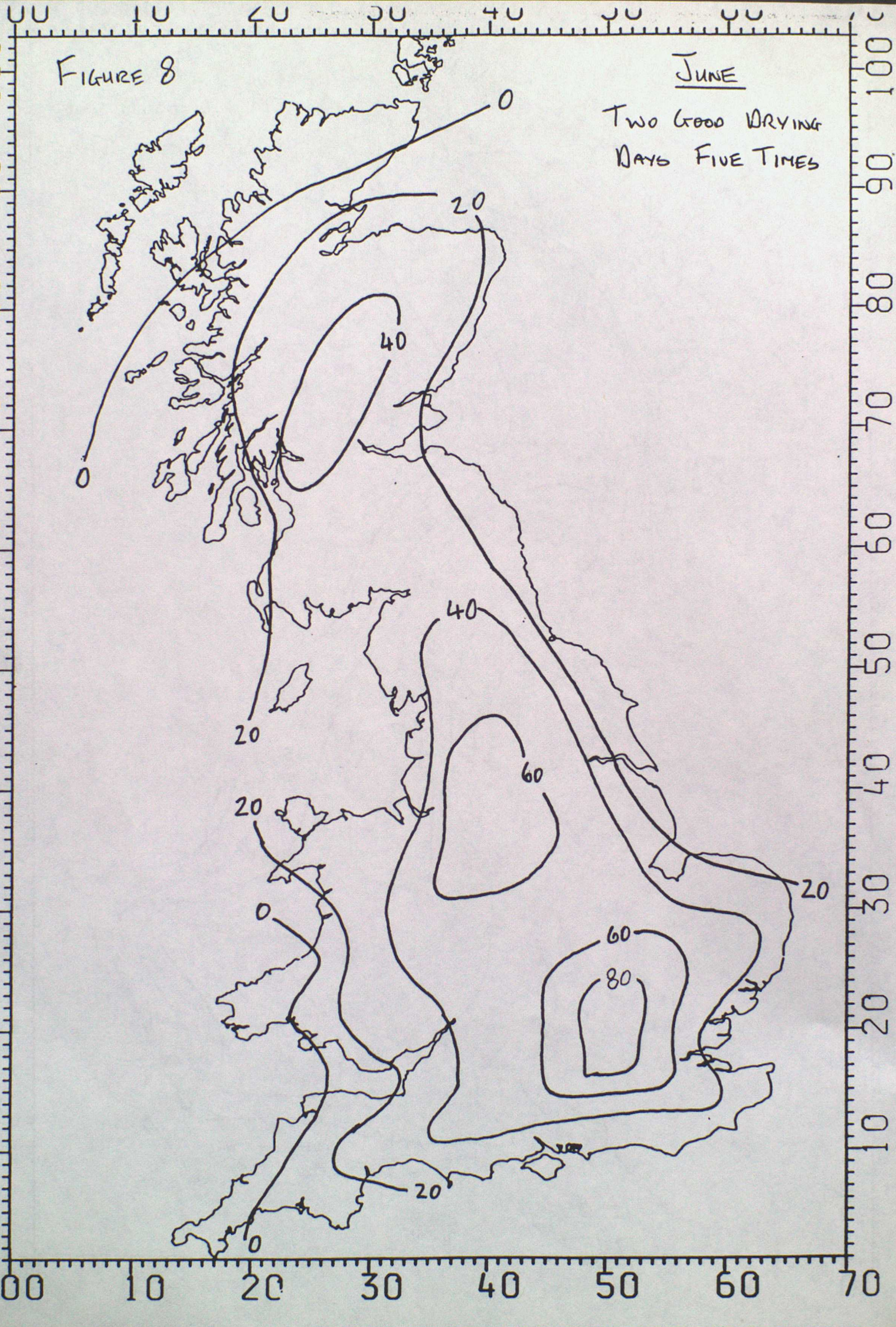
JUNE
TWO GOOD DRYING DAYS FIVE TIMES
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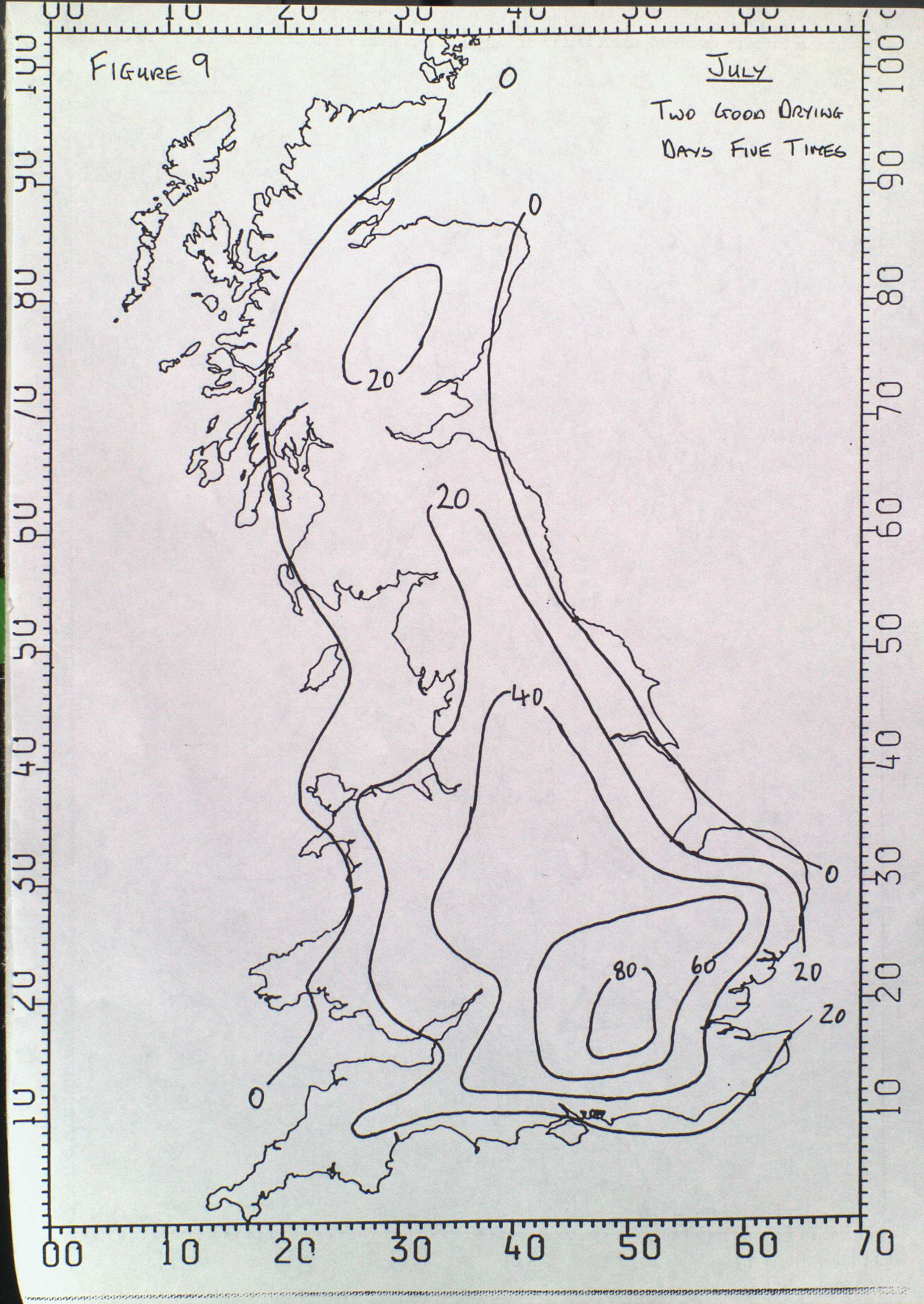
FIGURE 9


JULY
TWO GOOD DRYING DAYS FIVE TIMES
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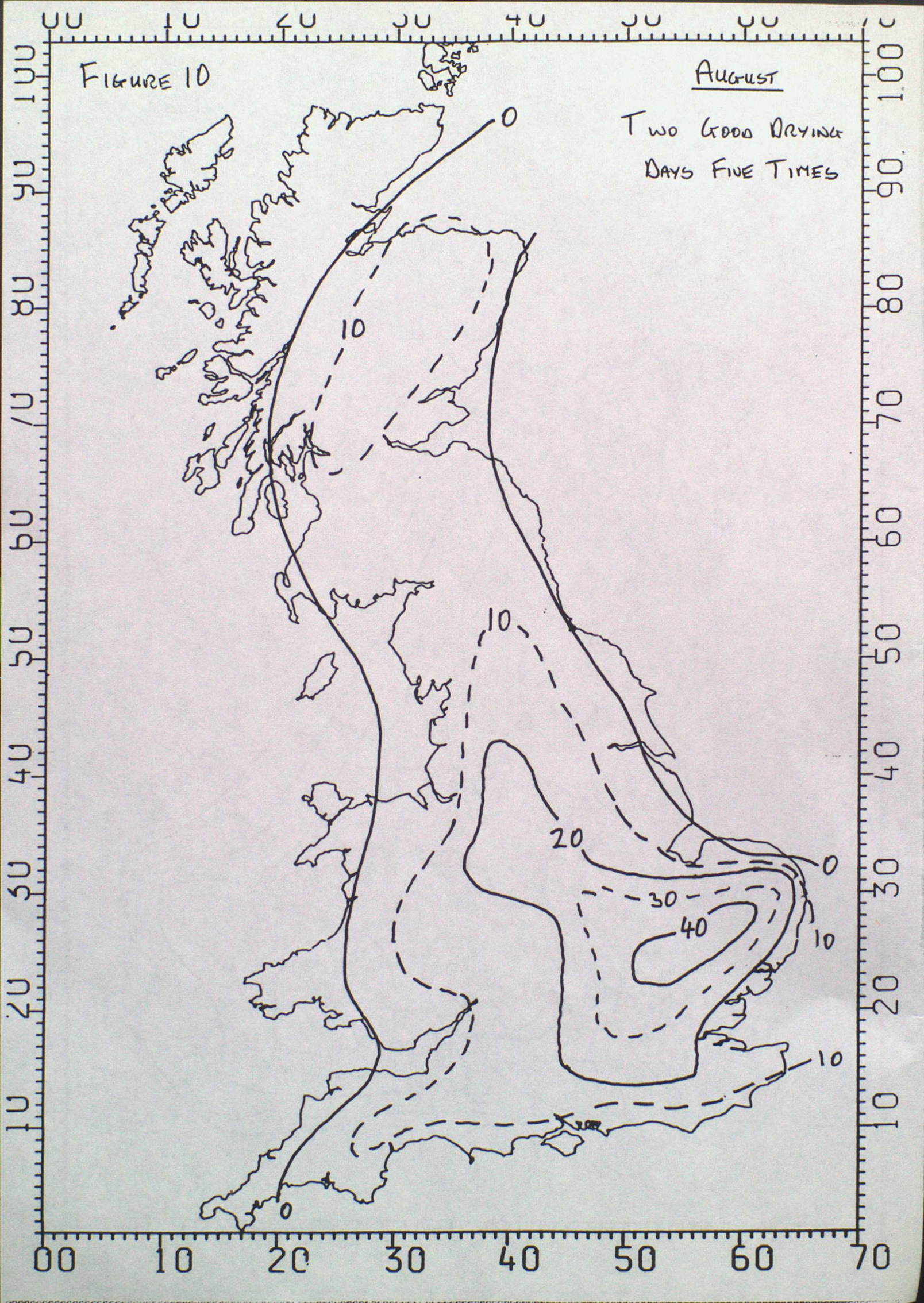
FIGURE 10
AUGUST
TWO GOOD DRYING DAYS FIVE TIMES
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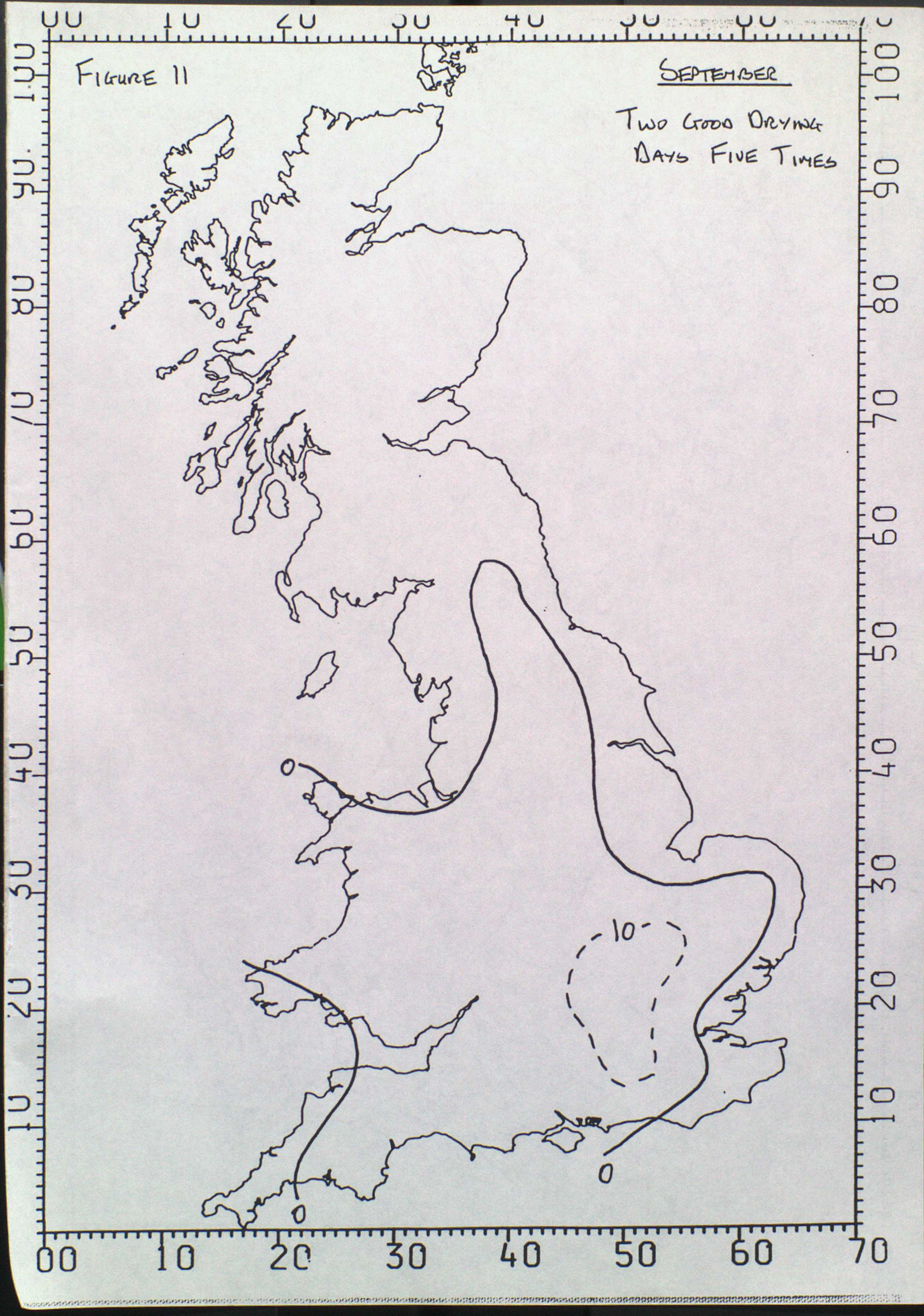
FIGURE 11
SEPTEMBER
TWO GOOD DRYING DAYS FIVE TIMES
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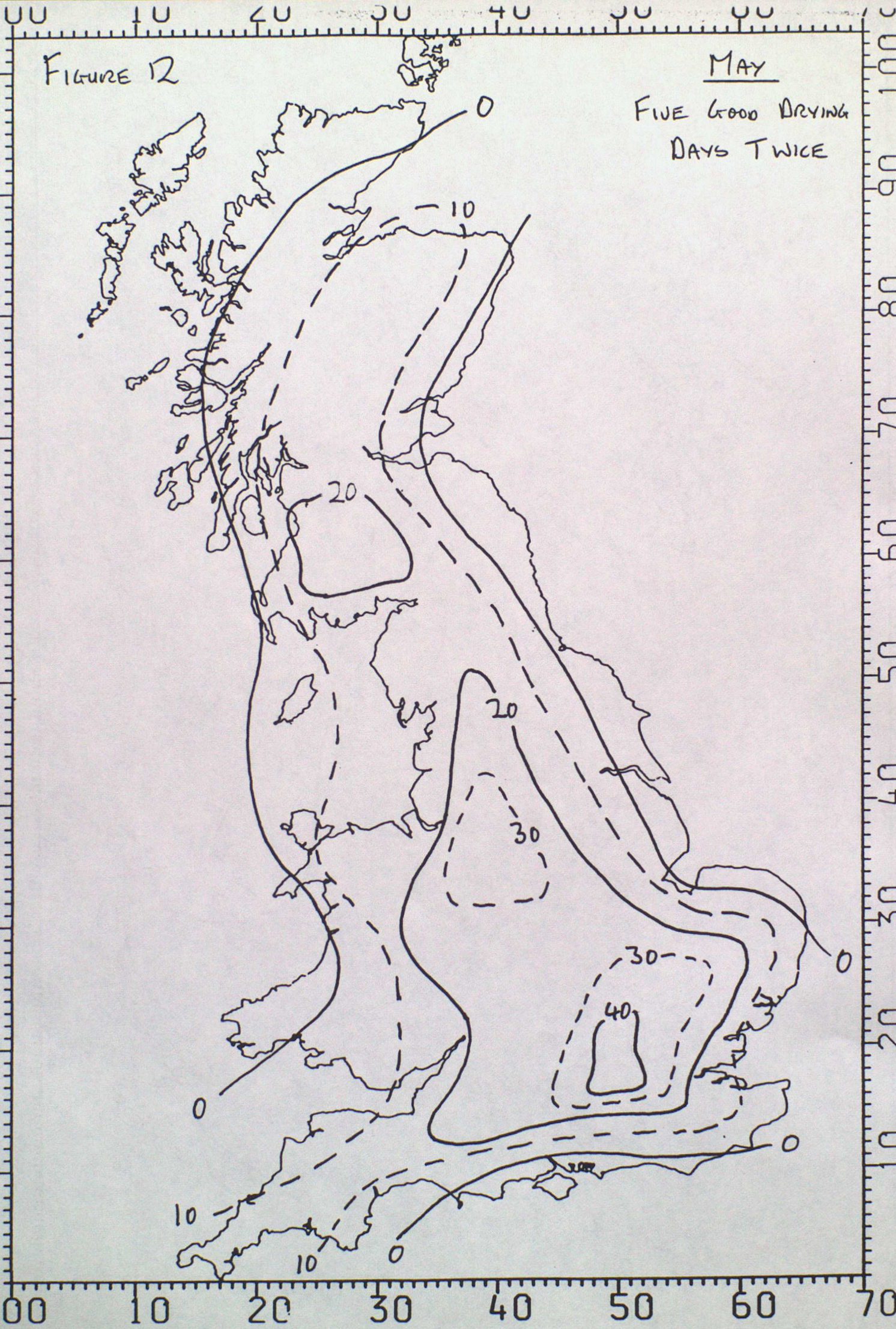
FIGURE 12



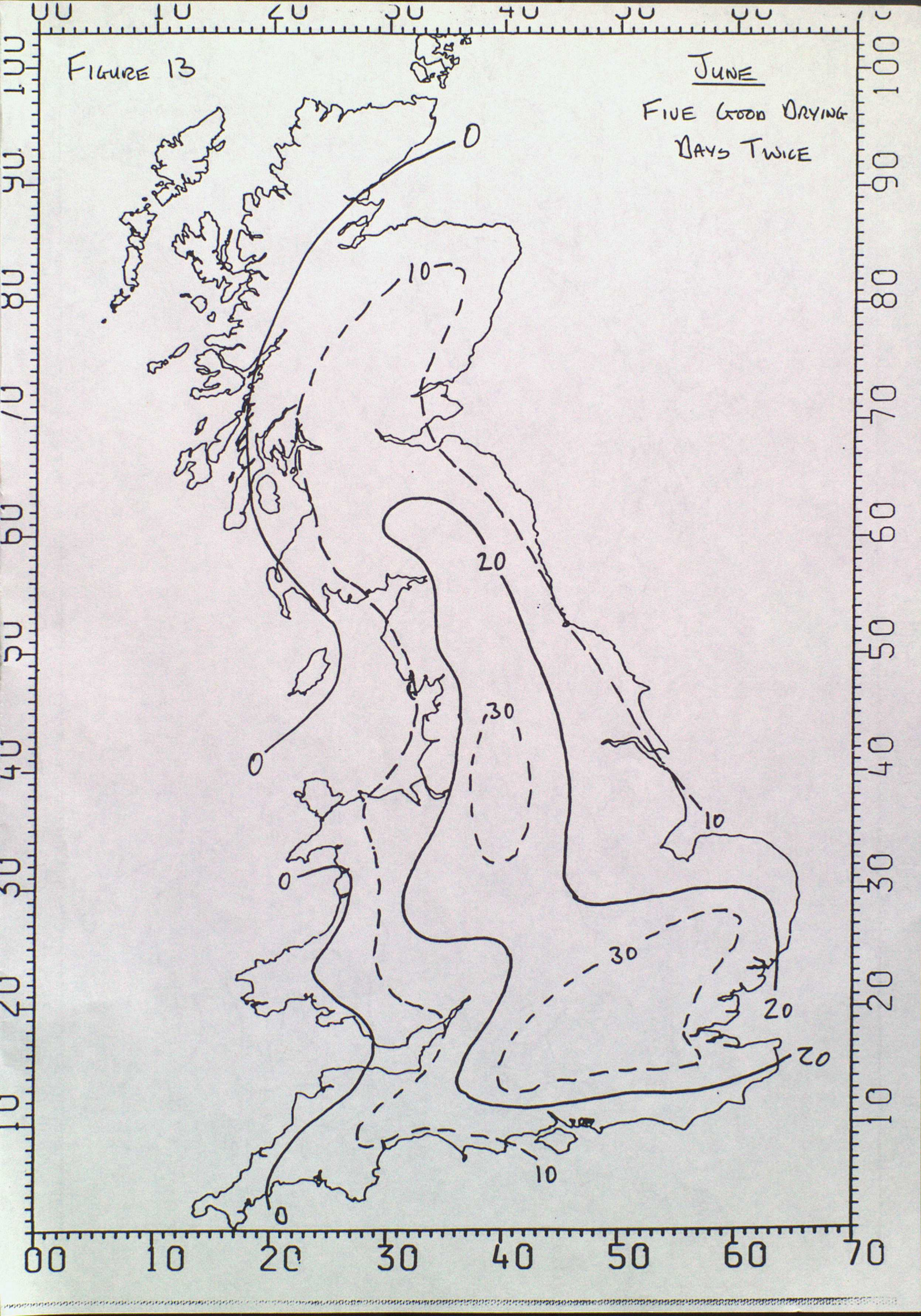


FIGURE 13
JUNE
FIVE GOOD DRYING DAYS TWICE
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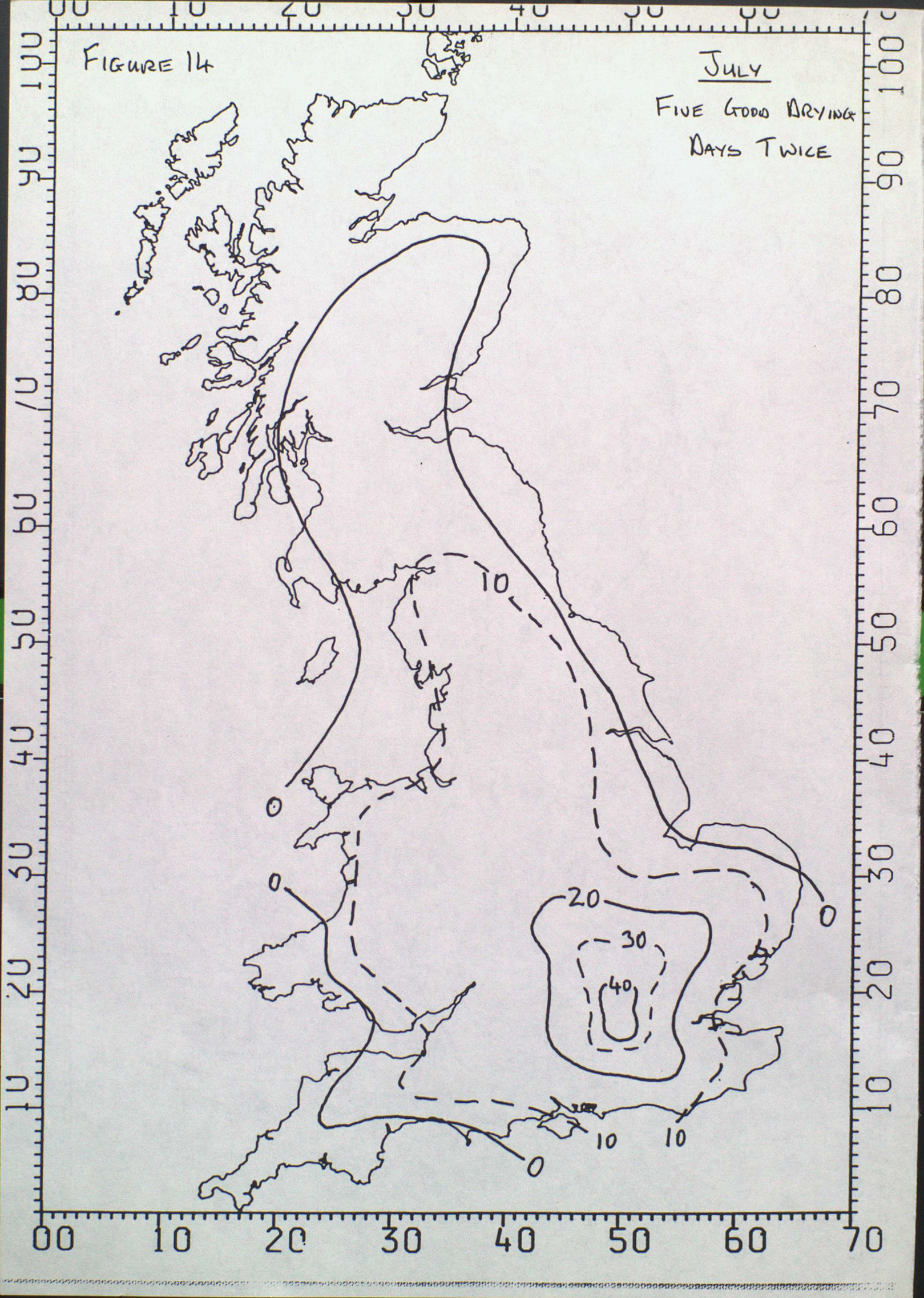
FIGURE 14


JULY
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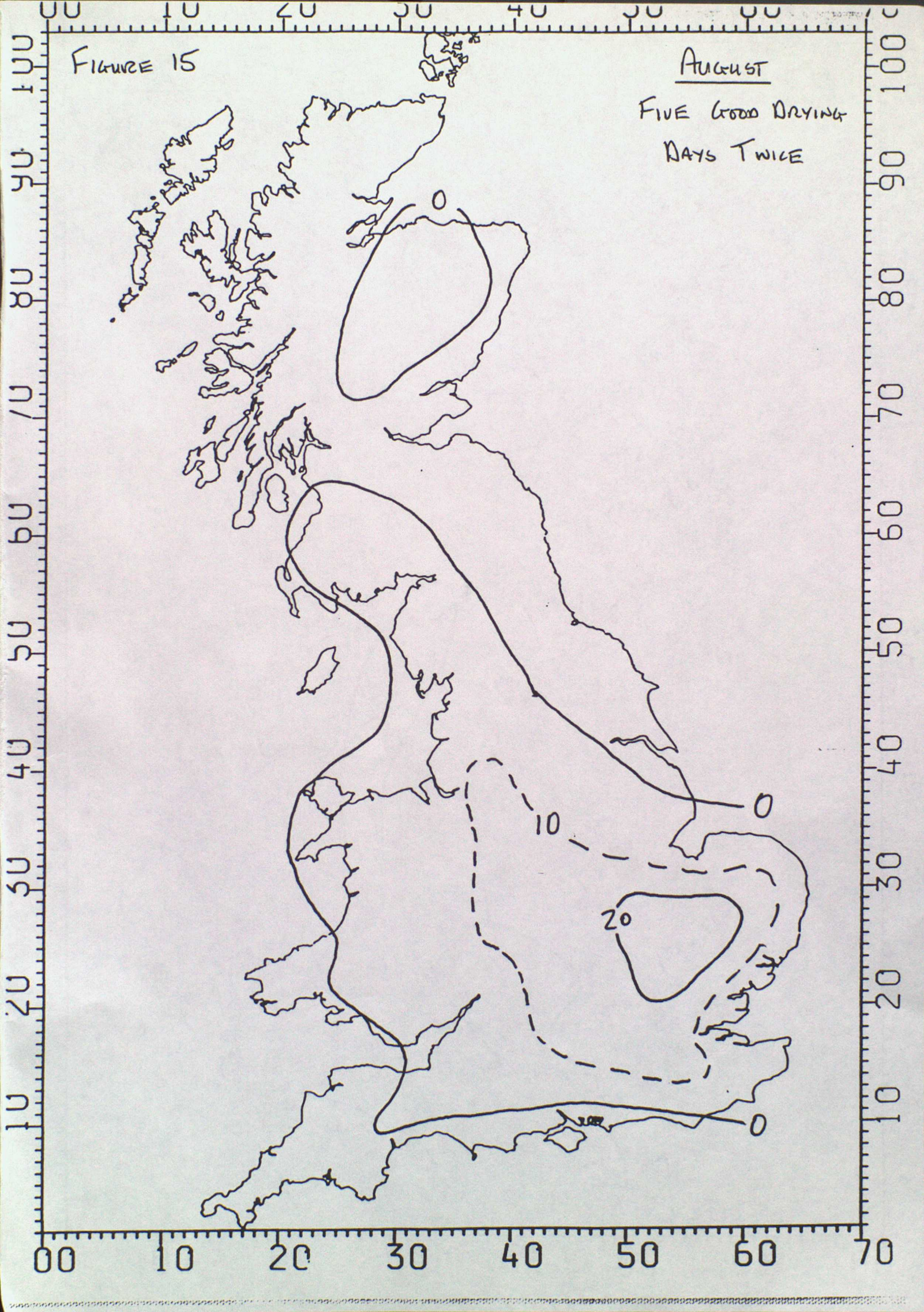
FIGURE 15
AUGUST
FIVE GOOD DRYING DAYS TWICE
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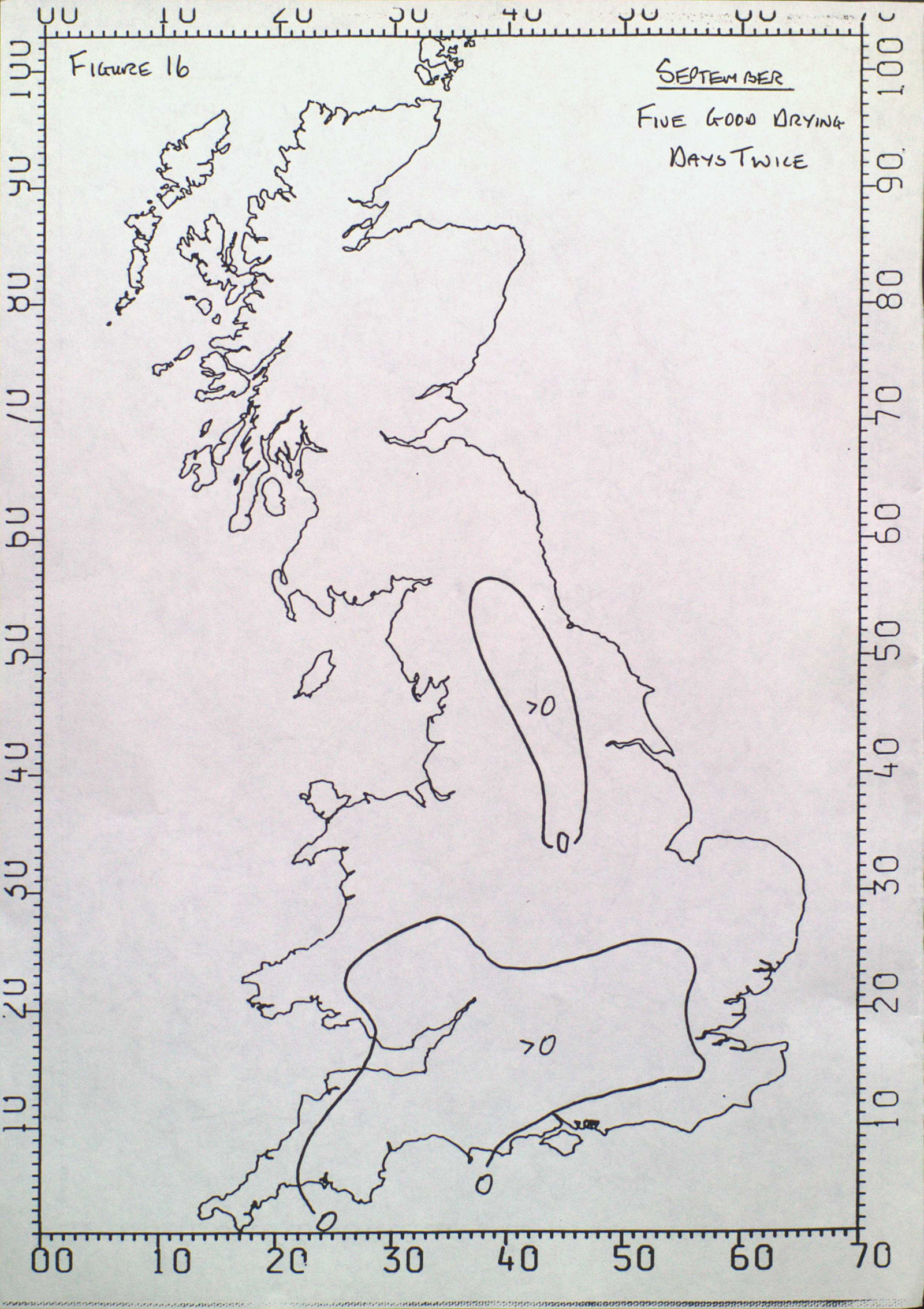
FIGURE 16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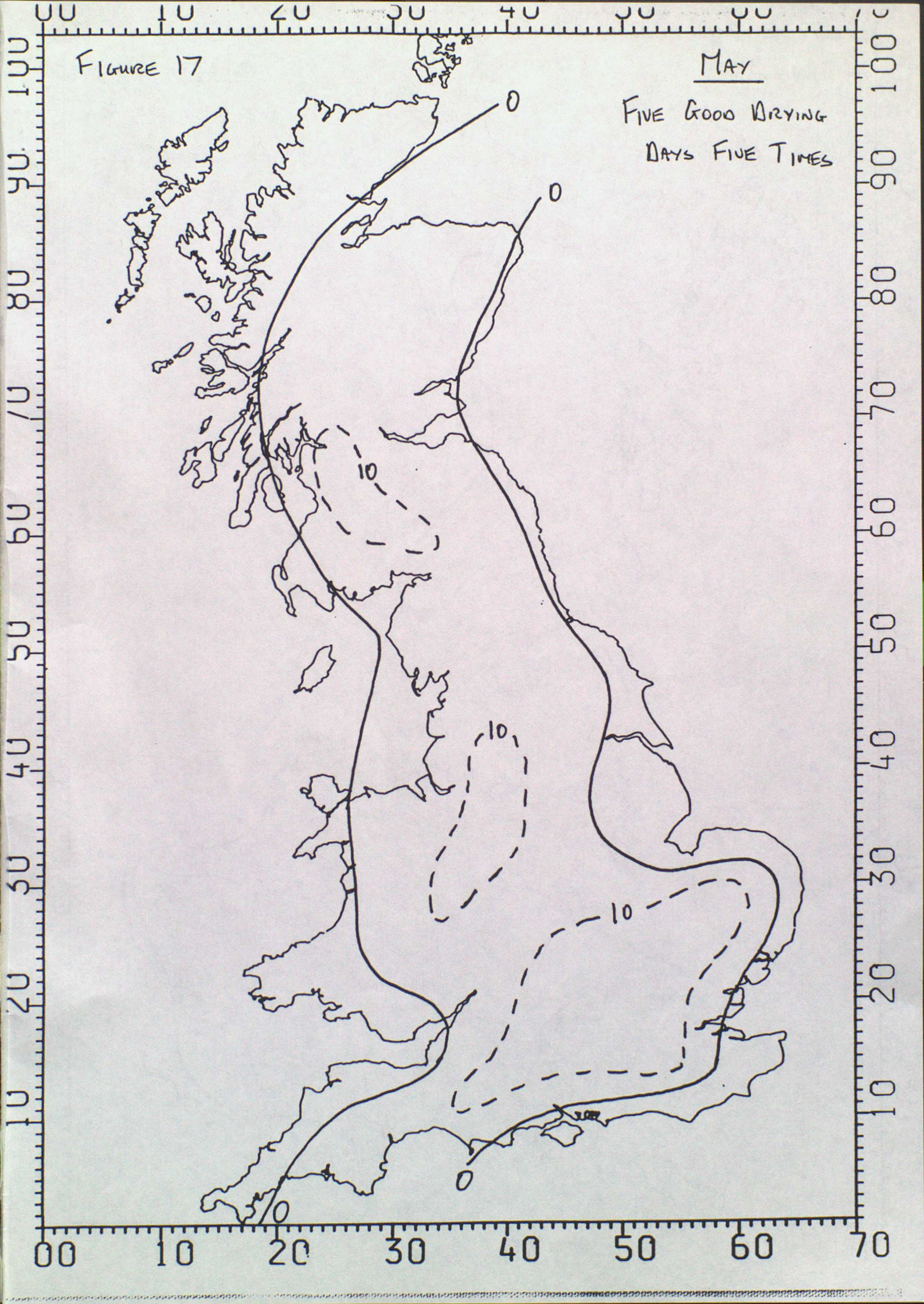
FIGURE 17
MAY
FIVE GOOD DRYING DAYS FIVE TIMES
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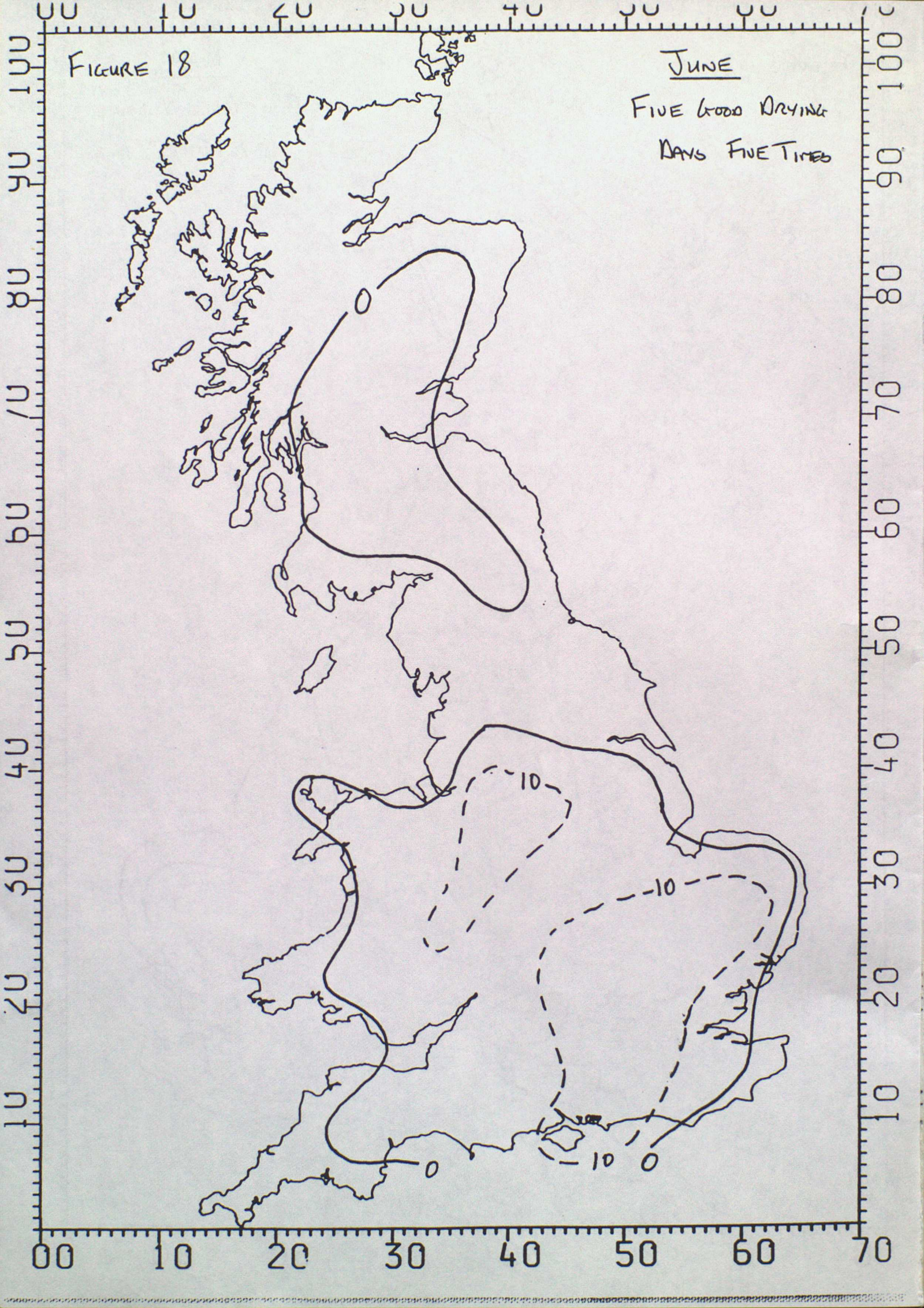
FIGURE 18

JUNE

FIVE GOOD DRYING DAYS FIVE TIMES



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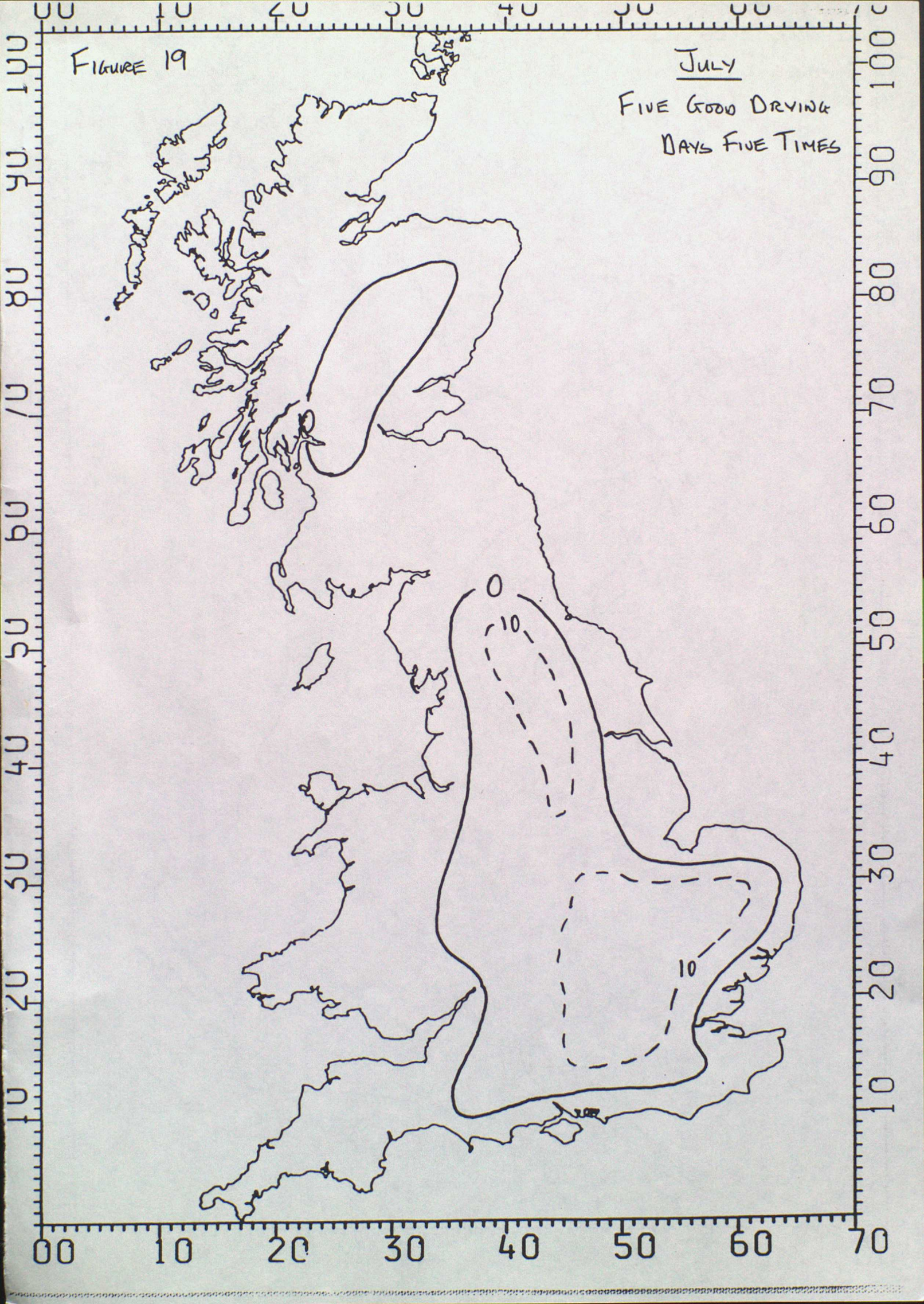
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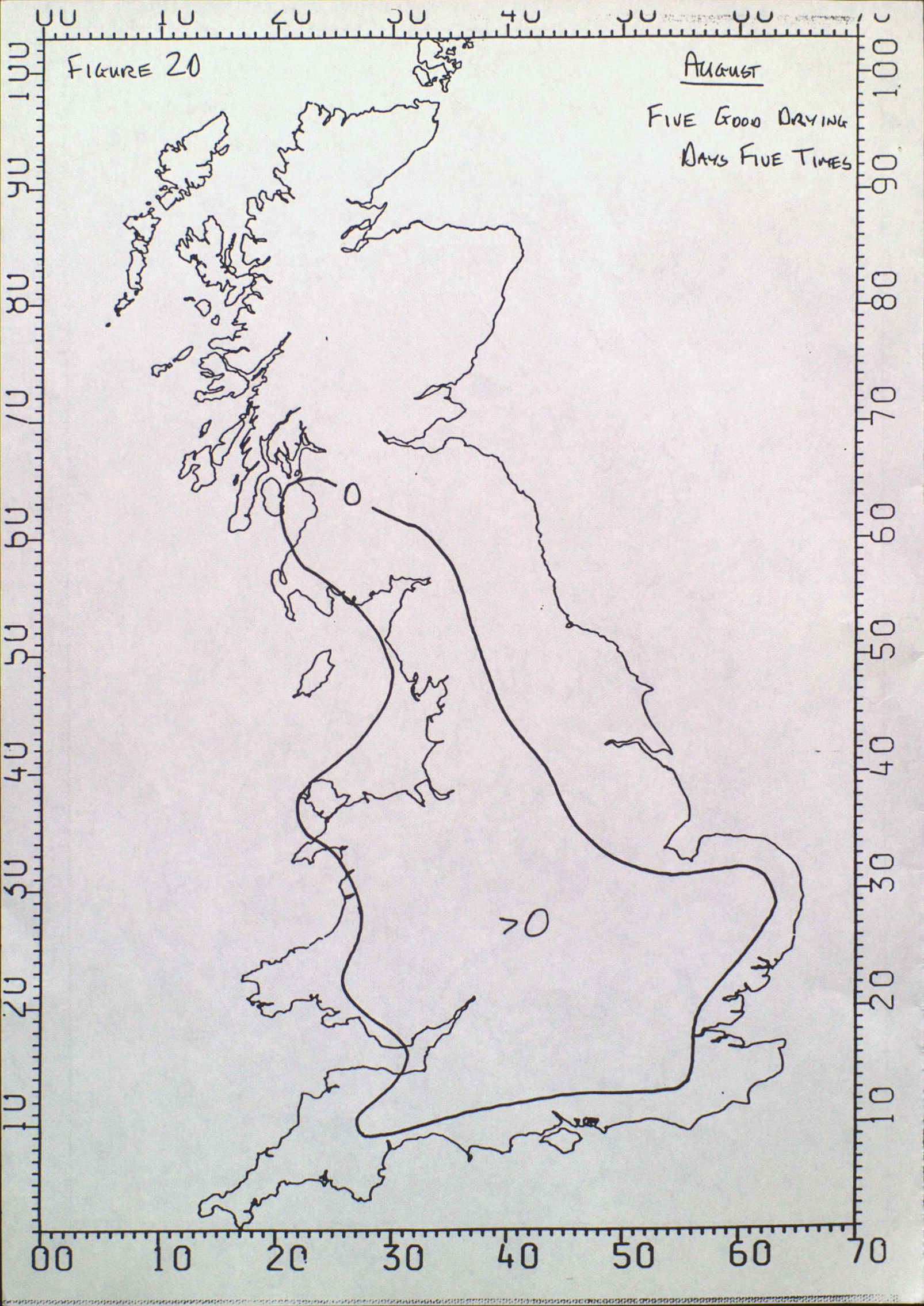
FIGURE 20
AUGUST
FIVE GOOD DRYING DAYS FIVE TIMES
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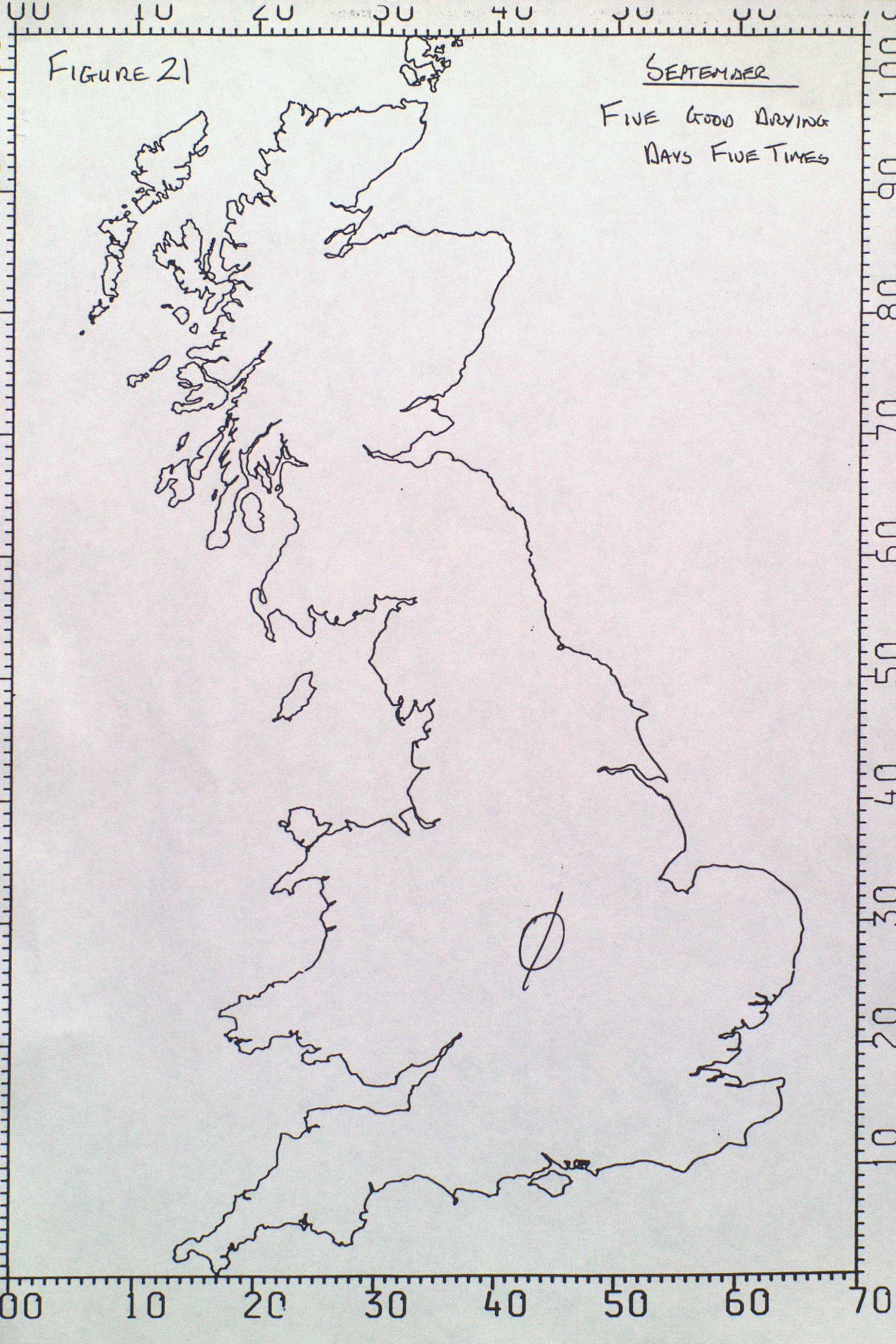
FIGURE 21



SEPTEMBER

FIVE GOOD DRYING DAYS FIVE TIMES